DEPARTMENT OF COMMERCE

TECHNICAL NEWS BULLETIN
OF THE BUREAU OF STANDARDS

Subscription, 25 cents a year (U. S.), 40 cents a year (Foreign). Address "Superintendent of Documents, Washington, D. C."

Washington, October, 1927—No. 126

CONTENTS

INTERNATIONAL UNION OF SCIENTIFIC RADIO TELEGRAPHY

During the present month the International Radio Conference is in session in Washington. In connection with this conference the International Union of Scientific Radio Telegraphy will also hold its regular international meeting, these meetings taking place once in three years. The several international unions are organized under the International Research Council, and the American sections are under the National Research Council with headquarters in Washington.

The aims of the international union are: (1) To promote the scientific study of radio communication, (2) to aid and organize research work requiring international cooperation and to encourage the discussion and publication of the results, (3) to facilitate agreement upon common methods of measurement and the standardization of measuring instruments.

The international union itself is an organization framework for carrying on the international phases of the administrative work. The actual technical work is done by the various national sections, under the following officers:

President, Gen. G. Ferrie, France.
Vice presidents:
Dr. L. W. Austin, United States.
Dr. W. H. Eccles, England.
Dr. Vanni, Italy.
Dr. V. Bjerknes, Norway.
General secretary, Dr. R. B. Goldschmidt, Belgium.

In order to correlate the work of the several national sections, the interna-

tional union has four international commissions only: (1) Methods of measurement and standards, (2) radio wave transmission phenomena, (3) atmospheric disturbances, (4) liaisons. The American section of the international union was organized in 1920 and is made up of an executive committee and five technical committees. The membership of the executive committee is as follows:

Dr. L. W. Austin, chairman, representing the international union as its vice chairman.

Dr. J. H. Dellinger, technical secretary, representing the Department of Commerce.

Dr. W. E. Tisdale, corresponding secretary, representing the division of physical sciences.

Prof. J. S. Ames, representing the division of physical sciences.

Maj. Gen. C. M. Saltzman, of the Army.

Dr. A. H. Taylor, representing the Navy.

Dr. A. N. Goldsmith, of the Institute of Radio Engineers.

Members at large:

E. F. W. Alexanderson.
Maj. Gen. George O. Squier.
Dr. A. E. Kennelly.
Dr. W. Wilson.
Prof. E. M. Terry.
F. Conrad.

The American section holds an annual meeting, at which progress reports are presented and technical papers read by various members of the committees.

The technical committees are as follows: (1) Methods of measurement and standards, (2) radio wave transmission phenomena, (3) variations in radio wave direction, (4) wave phenomena above three megacycles, (5) atmospheric disturbances.

Two of these committees are headed by members of the staff of the Bureau of Standards.

The chairman of the first committee is Dr. J. H. Dellinger, chief of the radio section of the bureau. This committee is concerned with radio measurements and standards, particularly as regards measurement work performed by other committees of this organization. The committee promotes and participates in the improvement and standardization of methods for measuring frequency, field intensity of received waves, intensity of atmospheric disturbances, automatic recording devices, fading, and other types of radio measurements.

The committee on radio wave transmission phenomena is headed by Dr. L. W. Austin, in charge of the bureau's laboratory for special radio transmission research. This committee encourages and conducts measurements upon received field intensities. It investigates, in connection with these measurements, diurnal and seasonal variations and effects of transmission under day and night conditions, sunset and seasonal effects, observation phenomena, etc. Special signals from high-power stations are employed in this work.

The chairman of the committee on radio wave direction is Dr. Gregory Breit, department of terrestrial magnetism, Carnegie Institution. This committee encourages and correlates research on the variations of wave direction with time, effects of topography on direction-finder work, and the bearing of polarization and other variations upon apparent observed phenomena.

The committee on wave phenomena above three megacycles is under the direction of Dr. A. H. Taylor, of the Naval Research Laboratory, Bellevue, D. C. The work covers such phenomena as daily and seasonal variations of received field intensities from high-frequency stations, character of fading and atmospherics, determination of skip distances, comparison of radio phenomena with magnetic and solar variations, weather, etc.

The committee on atmospheric distances, under H. T. Friis, of the Bell Telephone Laboratories, as chairman, promotes and coordinates measurements upon the intensity and direction of atmospheric, including daily and seasonal

variations, characteristics of the various types of atmospherics, their frequency distribution, and methods of measurement, including recording devices.

Many radio problems can only be studied on a world-wide scale, so the international union plays a very important part in our progress toward a better understanding of radio and other allied natural phenomena. The great variety of work covered is illustrated by the titles of papers presented at the open session on October 13, as follows:

Employment in combination of photoelectric cells and lamps having multiple electrodes in the solution of various questions relative to problems of time measurement.

International comparison of frequency standards.

Precision determinations of frequency.

The Navy's primary frequency standard.

A radio-frequency oscillator for receiver investigations.

An automatic recorder for radio signals and atmospheric disturbances.

Experiences in radio compass calibration.

Apparent night variations in crossed-coil radio beacons.

Ionization in the outer atmosphere of the earth.

The constitution of the earth's atmosphere up to great heights.

Ultrashort waves.

Height of the reflecting layer in August, 1927, and the effect of the disturbances of August 19.

The relation between radio reception, sun-spot position, and area.

Solar activity and radio transmission.

RADIO SIGNAL TRANSMISSIONS OF STANDARD FREQUENCY

The accompanying table gives a new schedule of radio signals of standard frequencies for use by the public in standardizing frequency meters (wave meters) and transmitting and receiving apparatus. The signals are transmitted from the bureau's station WWV. It is to be noted that a number of the individual frequencies differs somewhat from those used in previous transmissions.

The transmissions are by continuous-wave radiotelegraphy. The signals have a slight modulation of high pitch which aids in their identification. A complete frequency transmission includes a "general call" and "standard frequency" signal and "announcements." The "general call" is given at the beginning of the eight-minute period and continues for about two minutes. This includes a statement of the frequency. The "standard frequency signal" is a series of very long dashes with the call letter (WWV) intervening. This signal continues for about four minutes. The "announcements" are on the same frequency as the "standard frequency signal" just transmitted and contain a statement of the frequency. An announcement of the next frequency to be transmitted is then given. There is then a four-minute interval while the transmitting set is adjusted for the next frequency.

The signals can be heard and utilized by stations equipped for continuous-wave reception at distances up to about 500 to 1,000 miles from the transmitting stations. Information on how to receive and utilize the signals is given in Letter Circular No. 171, which may be obtained by applying to the Bureau of Standards, Washington, D. C. Even though only a few frequency points are received, persons can obtain as complete a frequency meter calibration as desired by the method of generator harmonics, information on which is given in the letter circular. The schedule of standard frequency signals is as follows:

Schedule of frequencies in kilocycles

[Approximate wave length in meters in parentheses]

Eastern standard time	Oct. 20	Nov. 21	Dec. 20	Jan. 20	Feb. 20	Mar. 20	Apr. 20
10 to 10.08 p. m.	550 (545)	1,500 (200)	3,000 (100)	550 (545)	125 (2,400)	300 (999)	3,000 (100)
10.12 to 10.20 p. m.	633.3 (473)	1,650 (182)	3,300 (91)	650 (461)	150 (1,999)	325 (923)	3,300 (91)
10.24 to 10.32 p. m.	733.3 (409)	1,800 (167)	3,600 (83)	750 (400)	175 (1,713)	350 (857)	3,600 (83)
10.36 to 10.44 p. m.	850 (353)	2,000 (150)	4,000 (75)	900 (333)	200 (1,499)	375 (799)	4,000 (75)
10.48 to 10.56 p. m.	975 (308)	2,250 (133)	4,400 (68)	1,050 (286)	225 (1,333)	400 (750)	4,400 (68)
11 to 11.08 p. m.	1,125 (266)	2,500 (120)	4,900 (61)	1,200 (250)	250 (1,199)	450 (866)	4,900 (61)
11.12 to 11.20 p. m.	1,300 (231)	2,750 (109)	5,400 (56)	1,350 (222)	275 (1,090)	500 (600)	5,400 (56)
11.24 to 11.32 p. m.	1,500 (200)	3,000 (100)	6,000 (50)	1,500 (200)	300 (999)	550 (545)	6,000 (50)

TRANSMISSION OF VITALIZING RAYS BY GLASS AND GLASS SUBSTITUTES

As the result of work in the bureau's radiometry section during the last few months it has been demonstrated beyond all reasonable doubt that all the new glasses now being marketed for transmitting the ultra-violet "vitalizing" or "activating" solar rays, at 290 to 310 millimicrons, undergo a photochemical action and decrease greatly in transparency to these activating rays when exposed to ultra-violet radiation.

The decrease in transmission of these glasses at 280 to 310 millimicrons is of the same nature whether the glass is exposed to the sun, the quartz mercury lamp, or the carbon arc, the change in transmission being relatively more rapid for the mercury arc than for the sun.

Glasses which transmit 15 to 25 per cent at 280 millimicrons when new decrease in transmission to less than 5 per cent (depending upon the thickness and the amount of ferrous iron present as an impurity) after a few hours' exposure to the mercury arc or a few weeks to the sun.

After this drop to about 2 or 3 per cent at 280 millimicrons, 15 to 20 per cent at 303 millimicrons, and 30 to 45 per cent at 313 millimicrons, prolonged exposure to the sun and to the mercury arc does not cause much further decrease in spectral transmission, as is to be expected since the photochemical action is fairly complete.

After this solarization has taken place these glasses probably still retain sufficient transparency to these vitalizing rays for therapeutic purposes. However, in all these glasses the transmission approaches rather close to the minimum limit that seems permissible in order to insure active stimulation of calcium metabolism, to prevent rickets, etc. The determination of this minimum limit in transmission for therapeutic purposes is a problem that will require further investigation by biologists.

ULTRA-VIOLET TRANSMISSION OF FABRICS

During the past month further measurements have been made on close-weave and open-weave fabrics submitted to the bureau as approximately pure cellulose (viscose) and cellulose acetate rayons. After eliminating the light transmitted through the openings between the threads the following ultra-violet transmission coefficients have been deduced for the (white, bleached, uncolored) threads:

Viscose varies from 16 to 27 per cent.

Cotton varies from 17 to 20 per cent.

Cellulose acetate varies from 11 to 29 per cent.

Silk varies from 14 to 18 per cent.

Wool varies from 5 to 15 per cent.

A slight coloring of the fabric by dyes or yellowing with age greatly de-

creases the transmission of the ultra-violet rays.

The bureau's tests on thin homogeneous colorless films of viscose rayon and on cellulose acetate rayon show that the latter is more opaque to the short-wave length ultra-violet rays, which is in agreement with the tests on the threads. The average viscose thread is more transparent than the average thread made from cellulose acetate.

After deducting for the openings between the threads, the transmission through the thread, especially when dyed, is only of the order of about 5 to 10 per cent. When one considers that the thread occupies from 95 to 99 per cent of the total space, a transmission of only 10 per cent of the total incident light is insignificant. Hence, it is apparent that in order to obtain beneficial therapeutic results, an open-weave fabric should be worn. Admitting this fact, it is apparent that it makes but little difference whether the thread is of cellulose acetate, cotton, wool, or silk. It seems evident that the importance of the composition of the material has been overestimated.

COTTON TEXTILE INSTITUTE RESEARCH ASSOCIATESHIP

The bureau takes pleasure in announcing the establishment of a research associateship in its textile section by the Cotton Textile Institute (Inc.).

The development of cotton materials for specific uses will be the primary object of this cooperative effort. It is planned to study the needs of the consumer for each specific use as the occasion arises, then try to find or develop the type of cotton material best suited to meet these needs.

The Cotton Textile Institute represents the cotton industry, and the connection thus formed assures the proper functioning of the facilities of the bureau in so far as cotton is concerned, along lines which will serve those most in need of authoritative data. For instance, the investigations mutually agreed upon are based primarily on the needs of the consumer.

The bureau's extensive textile testing equipment and the experimental cotton mill will be used in the study of these problems.

A. A. Mercier, who has been in charge of the experimental cotton mill at the bureau for a number of years, has been selected as a research associate for this work.

SPECIFICATIONS FOR RIGGING AND HYDRAULIC LEATHER

Bureau of Standards Circulars Nos. 339 and 340, just issued for distribution, contain the United States Government Master Specifications for rigging and hydraulic leathers, respectively. These are vegetable-tanned leathers used by the different Government establishments. The specifications were developed by the Committee on Leather Products, of the Federal Specifications Board, in cooperation with the leather laboratory of the bureau and representatives of the leather industry.

The specification for rigging leather requires that the material shall be furnished in three grades—light, medium, and heavy—in the form of sides.

The hydraulic-packing leather is also to be furnished in three grades, and either in the form of sides or butt bends.

The important technical requirements are summarized in the following table:

Property measured	Rigging leather	Packing leather
Thickness:		
Grade A, light ----------inches	7/64 up to 9/64	11/64 up to 13/64
Grade B, medium ----------inches	9/64 up to 11/64	13/64 up to 15/64
Grade C, heavy ----------inches	11/64 up to 13/64	15/64 up to 17/64
Strength-------lbs./in.[2]	3,500	3,500
Stretch, at stress of 2,500 lbs./in.[2]------per cent	[1] 15	[1] 15
Water absorption in 30 minutes-----per cent	[1] 20	[1] 20
Water soluble material ----------per cent	[1] 15	[1] 15
Grease----------do----	[2] 6	[2] 12
Do----------do----	[1] 12	[1] 18
Ash----------do----	[1] 1	[1] 1
Acid----------do----	[1] .75	[1] .75
Glucose----------do----	[1] 2	[1] 2

[1] Maximum.
[2] Minimum.

Both specifications contain illustrations of the units desired, together with instructions for sampling and complete methods for making the physical and chemical tests.

Copies may be secured for 5 cents each by addressing the Superintendent of Documents, Government Printing Office, Washington, D. C.

EFFECT OF CLAMPING DEVICE OF THE MULLEN PAPER TESTER ON TEST RESULTS

The Mullen paper tester is an instrument in extensive use for determining the bursting strength of paper. In making such test the specimen is clamped over a circular aperture and pressure applied to the specimen through a rubber diaphragm until the paper breaks. A study made by this bureau shows the clamping device of the instrument to be the source of considerable error in test results.

The gripping surface of the clamp, which holds the paper in position during test, consists of a rubber washer. Comparative tests of a clamp equipped with a new washer and one with a washer which had been in use for some time showed a divergence in test results amounting to as much as 8 per cent. The old rubber washer gave consistently lower results. It was noted that considerable slippage of the paper under test occurred with the new rubber washer and very little slippage with the old washer. Apparently the hardening of the washer with age improves its gripping quality. Since the rubber washer introduces a variable error in test results, its elimination is desirable.

To find the effect of the elimination of the rubber washer, a study was made of three different styles of all-metal clamps as compared with the rubber washer type. The all-metal clamps had different kinds of bearing surfaces, one having concentric grooves and the others having surfaces finished to different degrees of smoothness. In conjunction with the tests of the different clamps, a newly designed base plate was tested in combination with each clamp.

The results show that the all-metal clamps gave consistently lower results and permitted less creeping than the rubber-washer type, with the smoother surfaced metal clamp giving the best results. The comparative tests between the new and old design base plate do not show a sufficient difference in test results to justify a change in this respect from the present style.

A detailed report of this study was published in Paper Trade Journal, Vol. 85, No. 5, pp. 55–57; August 4, 1927.

ADHESIVENESS OF POSTAGE STAMPS

At the request of the Bureau of Engraving and Printing a number of experiments have been made to find the effect on the adhesiveness of postage stamps of contact with different materials used as separator sheets in books of stamps. These tests indicated that the adhesiveness of the stamps may be seriously impaired through contact with paraffin paper of certain qualities. Although the stamps adhere temporarily to ordinary cellophane, a special, moisture-proof cellophane seems to offer possibilities for this purpose.

SCIENTIFIC DATA ON DENTAL MATERIALS

The report on dental casting gold alloys mentioned in a previous issue of the Technical News Bulletin appears in the October number of the Dental Cosmos.

This and the previous reports furnish information sufficient to enable the college and research laboratories to make accurate investigations of these materials. The next problem to be solved, if these reports are to be made of greatest value, is the practical application of the results reported. This must be done by the profession.

The noticeable trend toward a more general use of scientific laboratory data in describing dental materials is very gratifying and will be of great value to the profession in selecting its materials. Unfortunately, in many instances, these data are of little value, by reason of the omission of some one or

more important details of tests. Sizes and shapes of specimens, methods of preparation, details regarding the alloy, whether cast or drawn, and similar items are often omitted. These omissions will, of course, be corrected as the testing laboratories and the profession become more familiar with their importance.

The cooperative research is being continued. Reports will be made as soon as additional results are secured.

FINE ANNEALING OF OPTICAL GLASS

It has been shown by investigators both in the United States and abroad that the index of refraction (and other physical properties of glass) are affected by the time and temperature at which the glass is annealed.

In preparing some glass for precision optical instruments it was found that the glass which was presumably well annealed showed variations from the average index of the magnitude of 37×10^{-6}. This variation was somewhat greater than was desired, and the glass was reannealed at a temperature of 486° C. for 14 days. As a result of this treatment the variation from the average was reduced to 12×10^{-6}, or about one-third the original variation.

The heat treating or annealing was done in a specially constructed electrically heated furnace, which consists, essentially, of a cylindrical cast-steel box 32 inches in diameter and 6 inches deep with heating elements above and below the box, the whole being insulated with 8 inches of diatomaceous earth on all sides. The glass was placed in this furnace between two smaller iron plates in the box to insure greater uniformity of temperature distribution. Heat absorption measurements were made on a piece of the glass before reannealing in order to determine the temperature at which the glass had been annealed previously, so that the subsequent annealing would not materially change the index of refraction from the original value.

Analysis of the data obtained indicates that there were sufficient temperature gradients in the furnace in which the glass was originally annealed to produce the large variation found, and that during reannealing there were still sufficient gradients, although they were much less than in the first case, to leave some optical inhomogeneity in the blanks. Results obtained in this experiment indicate that the greatest care must be taken to insure uniform temperature distribution if several pieces of glass are to be annealed and a uniform index of refraction obtained, and that if glass from the same melt is annealed at different times it is necessary to duplicate annealing temperatures within a very few degrees.

PHYSICAL PROPERTIES OF SEMIVITREOUS BODIES

Approximately four years ago the United States Potters Association began an investigation of the physical properties of semivitreous white ware for domestic table use. The work was done at, and with the cooperation of, the Bureau of Standards. The report, published as a limited edition by the potters' association, is largely nontechnical in character. It contains a résumé of the data obtained by physical tests of representative commercial bodies, bisque fired and glazed in various ways, and also a discussion of the petrographic study of several of the bodies. This discussion is illustrated by excellent reproductions of photomicrographs. The following are some of the more important conclusions: (1) American earthenware bodies differ more than is generally realized as regards their maturing temperature (which corresponds to firing to an absorption of about 8 per cent). Some mature fully at cone 7, others at cone 9. (2) There are two periods of firing during which the absorption of the body is materially decreased—one between cones 4 and 5 (because of the presence of English ball clay) and one between cones 6 and 8 (because of feldspar). (3) Desired maturity of a body can be obtained by firing at a lower temperature (cone 6, for example) and then holding at this temperature until cone 8 is down. Soaking at cone 4

lowers the absorption at an average rate of 0.97 per cent per hour, soaking at cone 6 lowers the absorption about 1 per cent per hour, and soaking at cone 8 lowers the absorption about 1.47 per cent per hour. (4) Glazed bodies usually are stronger mechanically than they are before glazing, but this presupposes a good "glaze fit." (5) In well-fired semivitreous bodies the fusion of the spar is complete, there is some surface attack of the spar on the flint particles, and the local formation of fine crystals of mullite. (6) A well-fired glaze will show considerable attack upon the surface of the body, resulting in the growth of mullite needles into the glaze at right angles to the body surface.

SHEARING TESTS ON SAND-LIME BRICK

In connection with an investigation of the strength of bond between mortar and sand-lime brick, a considerable number of physical tests have been made on the bricks used. It was believed that the results of the shearing tests would be of interest, inasmuch as there is only a limited amount of data of this nature to be found in the literature.

The apparatus used was designed at the bureau. In carrying out the test a cylindrical core is sheared out of the brick, the shearing strength being found by dividing the applied load by the area of the cylinder, exclusive of the ends. The sand-lime bricks had fairly smooth surfaces, so that a half brick could be placed in the apparatus, and only an occasional one required a little grinding against another brick to make the surfaces fit properly.

There were 701 "normal" half bricks tested in this way, the "normal" half bricks being about 2¼ inches in thickness. The average shearing strength value obtained was 1,055 lbs./in.^{2}, which was slightly less than one-half of the average value obtained in the compressive strength tests when the bricks were tested on edge.

In order to compare the effect of thickness of brick upon the shearing strength, a further test was made on 25 brick, which gave an average shearing strength of 805 pounds for the "normal" half brick. The other halves were cut lengthwise to give sections about 1 inch in thickness, and these gave an average of 1,650 lbs./in.^{2}.

CHARACTERISTICS OF SEVERAL HEAVY CLAYS

The Columbus branch of the bureau is conducting an investigation to determine the properties characteristic of various clays and shales used in the heavy clay industries. The object of most of the experimental work to date has been to determine the various physical properties of the unfired clays and shales, representative samples of which were obtained from various localities in Ohio. As indicated in Technical News Bulletin No. 119 (March, 1927) the various test pieces were cut from a regular brick-size column extruded from a small auger and pug mill. The various clays and shales were ground in a regular commercial 5-foot dry pan to pass a 12-mesh screen.

Although most of the shales show no great variation in grain size and sandiness, it is interesting to note that the slaking time varies from about 4 to 35 minutes. As would be expected, the sandiness and grain size of the alluvial clays vary considerably, and the slaking time runs from about 10 minutes to several hours. Although only about 50 per cent of the shales pass a 200-mesh screen, against about 95 per cent for the alluvial clays, there appears to be present in the shales considerable material of extremely fine or colloidal dimensions, since the water soon becomes very murky, while remaining clear in the case of the alluvial. The screen analysis apparently indicates the general workability and texture which are to be expected in running the clay or shale through an auger machine. The following table shows a typical wet screen analysis on an alluvial clay and a shale:

Sieve	Alluvial clay	Shale	Sieve	Alluvial clay	Shale
Retained on—	*Per cent*	*Per cent*	Retained on—Continued.	*Per cent*	*Per cent*
No. 60	2.7	38.0	No. 200	1.2	0.7
No. 100	3.5	4.2	No. 260	2.9	1.1
No. 150	2.4	1.4	Through No. 260	87.4	54.6

Although the tests have not been completed, the following table shows some of the average values obtained for several Ohio shales and alluvial clays. As one would expect, the alluvial clays required considerably more water to temper them properly than did the shales. Because of the incompleteness of the data, no correlation has been attempted:

Factor	Green shales		Green alluvial clays	
	Minimum	Maximum	Minimum	Maximum
Slaking time, minutes	4.4	33.0	10.0	150.0
Volume shrinkage, per cent	10.8	21.6	18.1	26.0
Calculated linear shrinkage, do	3.6	7.6	6.3	9.4
Tempering water, do	19.3	23.7	24.2	31.3
Modulus of rupture, lbs./in.^{2}	131.7	316.3	141.7	518.2
Porosity, per cent	23.3	31.4	26.2	35.1
Apparent specific gravity	2.58	2.75	2.61	2.76
Impact strength, gm/cm	2.14×10^5	4.32×10^5	1.60×10^5	5.76×10^5

BOND BETWEEN CONCRETE AND HOLLOW TILE

An investigation of the bond between concrete and hollow tile has just been completed. The factors covered by the tests included six different types of hollow tile and concrete mixtures of several consistencies and proportions. The tiles used in making the specimens were in a dry, saturated, or in a semisaturated condition. The specimens were cured either in dry or in damp storage. All specimens were tested when 28 days old, the damp-storage spemimens being allowed to dry out 14 days prior to testing. Concrete control cylinders 6 by 12 inches were made from the same batches as the concrete in each bond specimen.

The test specimens represented sections from a hollow tile concrete floor, each made up of two tiles joined by a concrete block 4 inches in thickness. The testing consisted in loading the concrete blocks by a heavy bearing block, the tiles forming the lower base. The desire was to obtain a shearing failure between the concrete. The results obtained indicate that the bond depends largely on the strength of the concrete, but this relation may be disturbed by using saturated tiles or damp curing. The condition least favorable to a good bond was found to exist when specimens were made from saturated tiles and then cured damp. This particular tile had an absorption of about 10 per cent. In general, damp curing did not increase the bond strength.

Specific factors which affected the bond strength were:

1. Strength of the concrete, the stronger the concrete the greater the bond.

2. Absorption of the tile, no general law being observable.

3. Amount of water in the tile, the greatest bond being developed by dry tile, slightly less by sprinkled tile, and the least bond by saturated tile. For tiles of the lowest absorption, about 3.1 per cent, there was no material strength difference in bond, whereas the greatest bond difference was recorded for the tiles with 5+ per cent absorption. The absorption ranged up to 21+ per cent.

4. Curing conditions. The dry-cured specimens developed a slightly higher average strength than the damp cured.

As a practical guide in construction, based on the results of these tests, it is recommended that the hollow tiles be sprinkled only enough to work off the dust and loose particles, and that the concrete contain the minimum amount of mixing water necessary for its proper placement.

A paper is being prepared for publication which will give the results of these tests in greater detail.

STATISTICS AND ECONOMICS OF BUILDING CONSTRUCTION

August construction contracts awarded in 36 Eastern States, as reported by the F. W. Dodge Corporation, amounted to $534,639,000, an increase of approximately 4 per cent over the July, 1927, total, but a decrease of 7 per cent from August, 1926, the record month of that year. The total value of contracts awarded in the first eight months of 1927 amounted to $4,121,295,000, as compared to $4,083,293,000 for the same period of 1926, an increase of 1 per cent.

The distribution of the awards by classes of construction show residential building approximately 4 per cent behind 1926, while public works and public utilities construction and commercial buildings show increases of 17.3 and 6.4 per cent. Industrial building shows a decrease of 32.5 as compared to 1926. All other classes show increases in 1927 except military and naval construction, which is relatively unimportant.

Construction costs and building material prices show slight decreases in the month of August, 1927, and as compared to the corresponding period in 1926.

CITY PLANNING AND ZONING

The division of building and housing recently issued (in mimeographed form) a report on zoning progress in the United States, which is up to date as of July 1, 1927, superseding a similar report issued last April. The number of zoned municipalities recorded in the 1926 report was 436, representing a population slightly in excess of 27,500,000, while the number recorded in the 1927 report is 553, representing a population of over 30,000,000.

The highest courts in 22 States have now upheld zoning ordinances. Permission of municipalities to zone is embodied in the laws of 46 States, according to a recent list prepared by the division, and 28 State laws now include all or a large part of the standard State zoning enabling act, which the department issued in 1924.

Lists of zoned municipalities arranged according to population have been brought up to date and are available for distribution. Requests should be addressed to the division of building and housing, Department of Commerce.

In this connection it is interesting to note that the city of Cincinnati has given the city planning commission jurisdiction over the acceptance and layout of all new streets, subject only to a different decision by a two-thirds vote of the city council, as proposed in the standard city planning enabling act.

HELP TO REDUCE COMMERCIAL FAILURES

One hundred and thirty-five thousand commercial failures from 1920 to 1927, inclusive, with total liabilities of $3,500,000,000, is a record that every retail credit manager can help to reduce. Seventy per cent of all the failures in 1924, 1925, and 1926 occurred in the trading groups, and their share of the total liabilities increased from 37¼ per cent in 1924 to 49 per cent in 1926.

Bradstreet's analysis of causes of failures during the years 1922 to 1926, inclusive, gives "incompetence" as the reason for 35 per cent of the cases and "lack of capital" for 33 per cent more. The other 27 per cent are scattered among "inexperience," "extravagance," "speculation," "fraud," etc.

In so far as "incompetence" expresses a deficiency in managerial ability, it can be overcome by intensive study and application of methods that have helped others to success, but oftentimes "lack of capital" means "too much money

tied up in slow moving or dead stocks." The effort to carry a wide variety, a large assortment, or a full line has handicapped many an otherwise capable merchant. Fear that he would lose trade if he could not fill every order that came his way has tempted more than one merchant to "overstock." Simplified practice helps the merchant to cut down his inventory, get quick turnovers, and better profits.

One merchant carried in his women's and children's hosiery department an average monthly investment of $55,850, divided among 26 manufacturers. His annual sales were $87,633 and his stock turned 1.57 times per year. Eighty per cent of his business was done on 5 brands, 20 per cent on the other 21. Even under these conditions he lost 54 per cent of the people who came in his store because four times out of five he did not have the size they wanted. He simplified his stocks to five brands, cut his investment to $29,000, and increased his sales to $187,795 a year. He cut his lost sales from 54 to 23 per cent and cut down the number of clearance or markdown sales necessary under the former conditions by 15 per cent. A well-known eastern hardware merchant cut out 31 per cent of his stock items, 28 per cent of his territory, and 56 per cent of his customers. These changes caused some decrease in his gross sales, but the volume of net profits increased 35 per cent in three years and the percentage of "net" to "sales" increased 68 per cent. These examples demonstrate the meaning of simplification.

A credit manager is in excellent position to bring this subject before the other executives of his company to determine if simplification will help increase the net profits. One hundred dollars saved each month, whether through the avoidance of bad-debt losses of that amount or through elimination of nonprofitable varieties of merchandise, is equivalent to a 6 per cent net return on $20,000 worth of new business. Excessive variety is often a profit waster. Simplification helps the credit manager in his job of saving profits.

DRUGGISTS' RESEARCH BUREAU

There has recently been formed a Druggists' Research Bureau, with offices at 51 Maiden Lane, New York, N. Y., to act as a national clearing house for obtaining facts necessary to the welfare and success of the drug industry.

The committee in charge consists of A. K. Mayer, of Indianapolis, chairman; J. F. Finneran, of Boston, vice chairman; G. B. Evans, Albany, N. Y.; Sidney Hollander, Baltimore; Ambrose Hunsberger, Philadelphia; H. S. Noel, Indianapolis; P. C. Olsen, Philadelphia; Alf. W. Pauley, St. Louis; J. T. Woodside, Chicago; and E. L. Newcomb, secretary.

The bureau gathers facts making for the better conduct of the industry. These include data on simplification of stock to increase turnover and increase profits, simplification and standardization of cost accounting, and simplification and standardization of arrangement of stock to expedite service within the drug store and eliminate waste. In the research work along the lines of simplification the division of simplified practice will cooperate with the Druggists' Research Bureau.

SIMPLIFICATION OF HOSPITAL SUPPLIES

The second day of the 1927 American Hospital Conference, October 11, was devoted to hearing the report of the committee on simplification and standardization of furnishings, supplies, and equipment. This report was presented to the Minneapolis convention by Miss Margaret Rogers, chairman of the committee. Perhaps no other activity of the association has attracted as much attention as the work of Miss Rogers and her associates in their endeavor to eliminate wasteful practices resulting from the lack of any efforts on the part of institutional people to standardize on the sizes of certain items of equipment and supplies.

Directly resulting from the labors of the committee, in collaboration with the

division of simplified practice, the number of bed sizes has been reduced from 33 to 1 standard length, and because of the saving in manufacturing costs thus affected the standard sizes of beds can now be purchased at lower prices. The members of the committee are Miss Margaret Rogers, St. Luke's Hospital, of St. Paul, Minn., chairman; Charles F. Neergaard, 512 Fifth Avenue, New York, N. Y.; David C. Shepard, of St. Luke's Hospital, St. Paul; Sister M. Veronica, of Mercy Hospital, Chicago; and Dr. G. Walter Zulauf, of Allegheny General Hospital of Pittsburgh.

NEW PUBLICATIONS

Additions to Supplementary List of Publications of the Bureau of Standards (beginning July 1, 1926)

Scientific Papers[1]

S555. A weight burette for the micro-measurement of liquid volumes; Martin Shepherd. Price, 5 cents.

S556. Current distribution in supraconductors; F. B. Silsbee. Price, 10 cents.

S557. A suggested new base point on the thermometric scale and the α β inversion of quartz; Frederick Bates and Francis P. Phelps. Price, 5 cents.

Technologic Papers[1]

T348. Tarnish-resisting silver alloys. L. Jordan, L. H. Grenell, and H. K. Herschman. Price, 15 cents.

Circulars[1]

C333. Specifications for the manufacture and installation of two-section knife-edge railroad track scales. Price, 10 cents.

United States Government Master Specifications for:

C339. Rigging leather. Price, 5 cents.

United States Government Master Specifications for—Continued.

C340. Hydraulic packing (vegetable tanned) leather. Price, 5 cents.

C342. Hollow, clay, load-bearing wall tile. Price, 5 cents.

C343. Hollow, clay, fireproofing, partition, and furring tile. Price, 5 cents.

C344. Hollow, clay, floor tile. Price, 5 cents.

C345. Common clay brick. Price, 5 cents.

Technical News Bulletin[1]

TNB126. Technical News Bulletin, October, 1927.

OUTSIDE PUBLICATIONS[2]

A redetermination of the Newtonian constant of gravitation. Paul R. Heyl; Proceedings of the National Academy of Sciences (Washington, D. C.), Vol. 13, No. 8, p. 601; August, 1927.

Correction of a prevalent error in regard to the data on photometric sensibility as a function of wave length at low brightness. I. G. Priest; Journal, Optical Society of America and Review of Scientific Instruments (Ithaca, N. Y.), Vol. 15, No. 2, p. 82; August, 1927.

Standard solar wave lengths. Keivin Burns and C. C. Kiess; Publications of the Allegheny Observatory (Pittsburgh, Pa.), Vol. VI, No. 8, p. 125; September, 1927.

Cold light. W. W. Coblentz; Scientific American (New York, N. Y.), Vol. 137, No. 4, p. 316; October, 1927.

Sources and properties of thermal radiation, especially ultra-violet rays used in phototherapy. W. W. Coblentz; Physical Therapeutics (New York, N. Y.), Vol. XLV, No. 9, p. 407; September, 1927.

Bureau of Standards circular on ultra-violet glass. W. W. Coblentz; the Glass Industry (New York, N. Y.), Vol. 8, No. 10, p. 240; October, 1927.

[1] Send orders for publications under this heading, with remittance, only to Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 25 cents per year (United States, Canada, and Mexico); 40 cents (foreign).

[2] "Outside publications" are not for distribution or sale by the Government. Requests should be sent direct to publishers.

The quantitative microscopic analysis of commercial feldspar. Herbert Insley; Journal, American Ceramic Society (Columbus, Ohio), Vol. 10, No. 9, p. 651; September, 1927.

Refractories for melting pure metals; iron, nickel, and platinum. L. Jordan, A. A. Peterson, and L. H. Phelps; Transactions, American Electrochemical Society (New York, N. Y.), Vol. 50, p. 155; 1926.

Progress in the study of normal and abnormal steel. S. Epstein and H. S. Rawdon; Transactions, American Society for Steel Treating (Cleveland, Ohio), Vol. 12, p. 337; 1927.

Recent experiments relating to the wear of plug gauges. H. J. French and H. K. Herschman; Preprint for September, 1927, meeting, American Society of Steel Treating (Cleveland, Ohio).

Metals to resist corrosion or high temperature. H. J. French; Transactions, American Electrochemical Society (New York, N. Y.), Vol. 50, p. 47; 1926.

Miscellaneous nonferrous metals and alloys (in symposium, "Chemistry's Contribution to Automotive Transportation," American Chemical Society). H. W. Gillett; Industrial and Engineering Chemistry (Washington, D. C.), Vol. 19, p. 1091; September, 1927.

The problem of materials for extreme conditions. H. W. Gillett: Transactions, American Electrochemical Society (New York, N. Y.), Vol. L, p 35; 1926.

Determining the stress-strain relation of rayon yarns. Equitension lea method. W. T. Schreiber and H. A. Hamm; Textile World (New York, N. Y.), Vol. LXXII, No. 13, p. 97; September 24, 1927.

Head of U. S. Standards Bureau sees gain in strength of rayon. Charles W. Schoffstall; Daily News Record (New York, N. Y.), Section 2, p. 9; September 21, 1927.

Aging of rubber bands in storage. C. E. Boone; India Rubber World (New York, N. Y.), Vol. LXXVI, No. 6, p. 317; September, 1927.

Rubber stopcock lubricants for high vacuum and other uses. Martin Shepherd and P. G. Ledig; Industrial and Engineering Chemistry (Washington, D. C.), Vol. 19, p. 1059; September, 1927.

Uniform traffic signs, signals, and markings. M. G. Lloyd; The Annals of the American Academy of Political and Social Science (Concord, N. H.), Vol. CXXXIII, No. 222, p. 121; September, 1927.

U. S. GOVERNMENT PRINTING OFFICE: 1927

The quantitative microscopic analysis of commercial feldspar. Herbert Insley; Journal, American Ceramic Society (Columbus, Ohio), Vol. 30, No. 9, p. 2[illegible]; September, 1947.

Refractories for melting pure metals; iron, nickel, and platinum. L. Jordan, A. A. Peterson, and L. H. Phelps; Transactions, American Electrochemical Society (New York, N. Y.), Vol. 50, p. [illegible]; 1926.

Progress in the study of normal and abnormal steel. S. Epstein and H. S. Rawdon; Transactions, American Society for Steel Treating (Cleveland, Ohio), Vol. [illegible], p. [illegible]; 1927.

Recent experiments relating to the wear of plug gauges. H. J. French and H. K. Herschman; Preprint for September, 1927, meeting, American Society of Steel Treating (Cleveland, Ohio).

Metals to resist corrosion or high temperature. H. J. French; Transactions, American Electrochemical Society (New York, N. Y.), Vol. 50, p. [illegible]; 1926.

Miscellaneous nonferrous metals and alloys for aeroplanes. "Chemistry's Contribution to Automotive Transportation," American Chemical Society. H. W. Gillett; Industrial and Engineering Chemistry (Washington, D. C.), Vol. 19, p. [illegible]; September, 1927.

The problem of materials for extreme conditions. H. W. Gillett; Transactions, American Electrochemical Society (New York, N. Y.), Vol. [illegible], p. [illegible]; 1926.

Determining the stress-strain relation of rayon yarn. Equitension load method. W. T. Schreiber and H. A. Hamm; Textile World (New York, N. Y.), Vol. LXXII, No. 13, p. 97; September 24, 1927.

Head of U. S. Standards Bureau sees gain in strength of rayon. Charles W. Schaefer; Daily News Record (New York, N. Y.), Section 2, p. 9; September 21, 1927.

Aging of rubber bands in storage. C. E. Boone; India Rubber World (New York, N. Y.), Vol. LXXVI, No. 6, p. 3[illegible]; September, 1927.

Rubber stopcock lubricants for high vacuum and other uses. Martin Shepherd and F. G. Ledig; Industrial and Engineering Chemistry (Washington, D. C.), Vol. 19, p. [illegible]; September, 1927.

Uniform traffic signs, signals, and markings. M. G. Lloyd; The Annals of the American Academy of Political and Social Science (Concord, N. H.), Vol. CXXXIII, No. [illegible]; September, 1927.